ASN.1 validation proposal for the next TTCN-3 conformance STF

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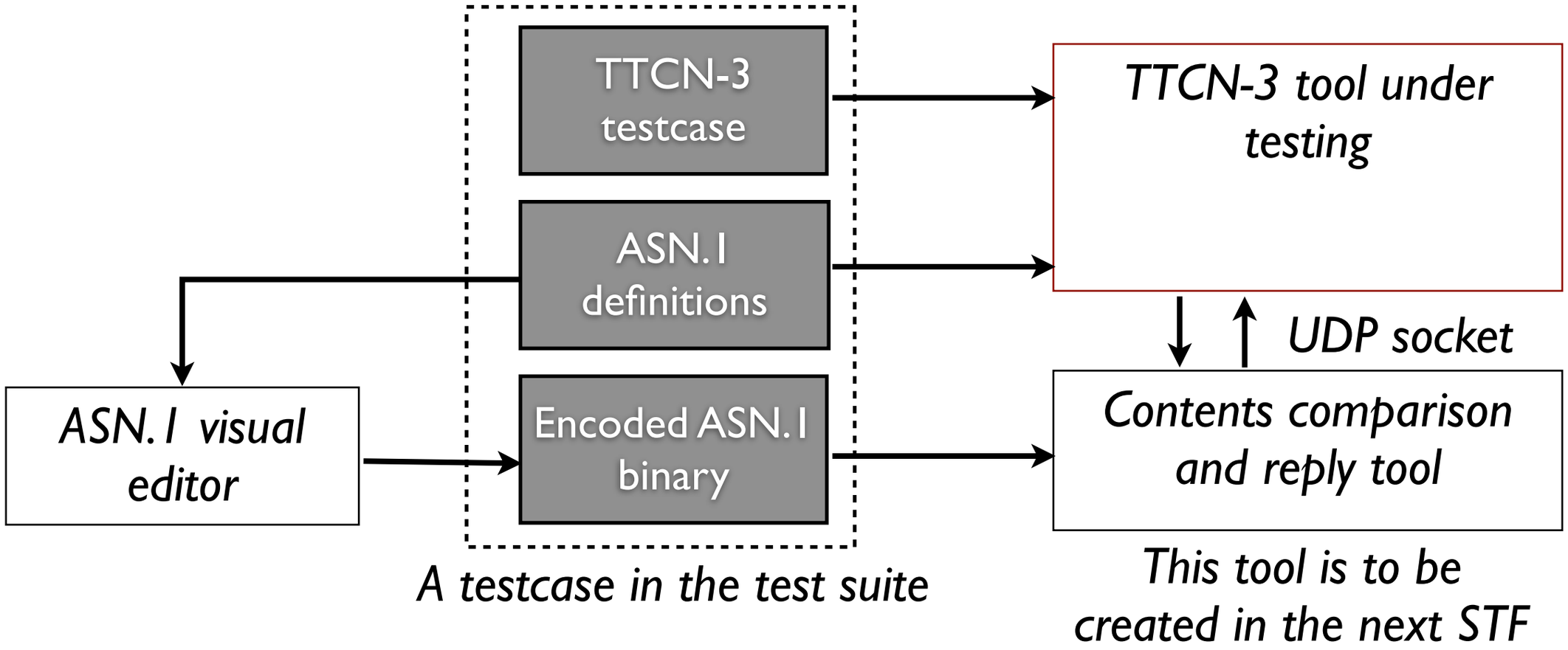
Introduction

- Besides the validation of the core TTCN-3 standard, the conformance testing of the using XML encoding (ETSI ES 201873-9) have been recently added into the scope of the TTCN-3 conformance testing STFs. The next logical step is to ensure also the conformance of using ASN.1 encoding with TTCN-3 (ETSI ES 201873-7).
- This presentation introduces a proposed methodology and scope for such conformance testing.
- The aim is to validate both the mapping between TTCN-3 and ASN.1 syntaxes, as well as the actual ASN.1 encoding/decoding.

Proposed testcase structure

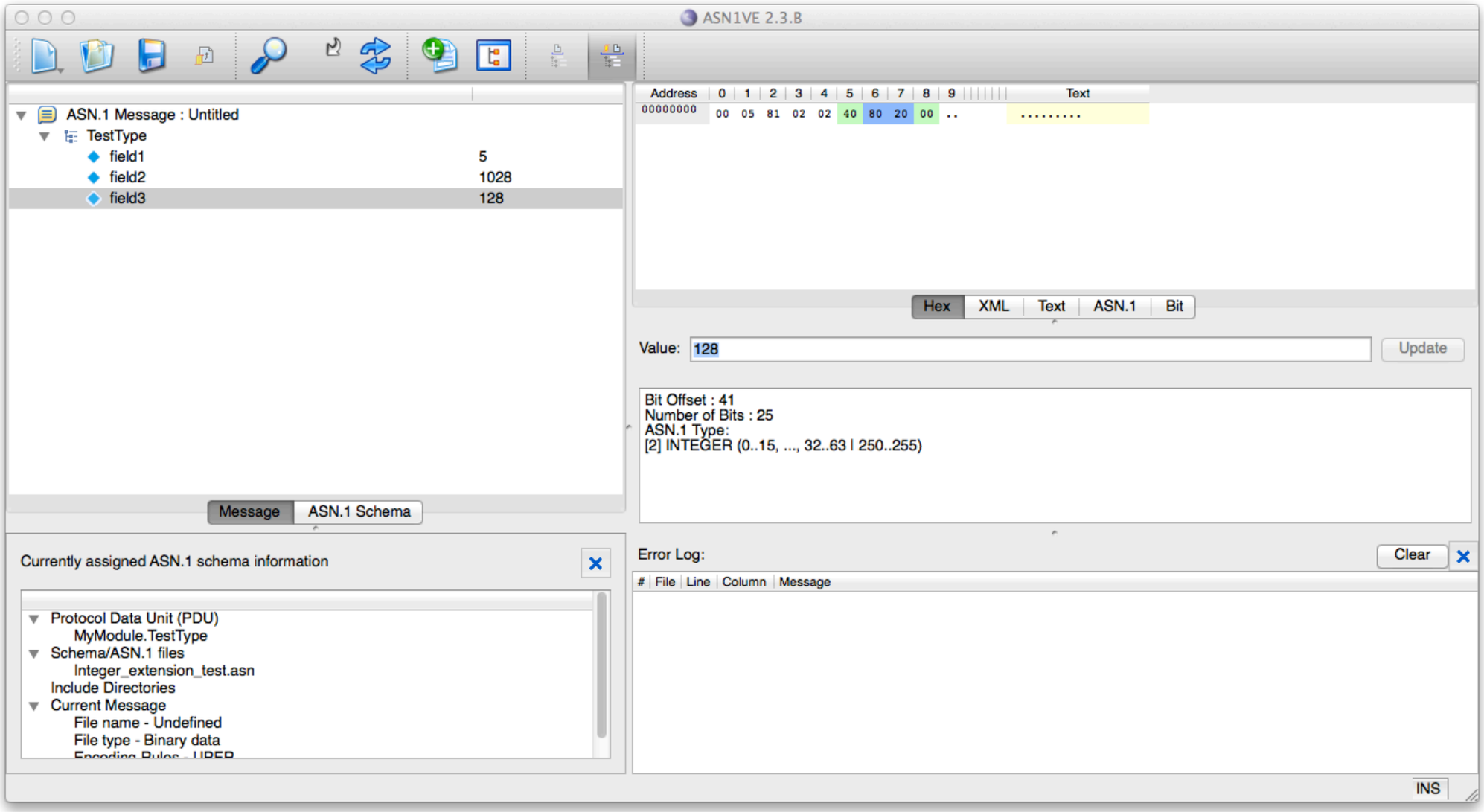
The proposed testcase structure and methodology is similar to the methodology used for XML testing:



The testing may be done over any BER or PER encoding variety of interest.

The testcase verdict takes into account the outputs from both the TTCN-3 and message content comparison tools

ASN.1 Visual Editor



A useful tool for generating encoded messages from the ASN.1 definitions. The idea is to use the GUI to have the message contents aligned with the TTCN-3 definition.

Objective Systems' ASN1VE tool seems to fit this purpose well. Since most TTCN-3 tools use the OSS Nokalva ASN.1 compiler, it is better to use a different ASN.1 engine to generate binaries for the validation test.

What to test: ASN.1-to-TTCN mapping definitions

The following example shows the validation of a name mapping rule, as defined in ES 201873-7.

```
ASN1module DEFINITIONS ::=
BEGIN
Message-PDU ::= SEQUENCE {
        value       INTEGER,
        message     OCTET STRING
    }
END
```

```
module Sem_F0101_matching_specific_value_002 {

    import from ASN1module language "ASN.1:2002" all; // TTCN-3 reference to ASN.1

    const Message_PDU c_example := {
     value_ := 5,
     message_ := 'FF'O
    }

    type enumerated EnumeratedType {e_black, e_white};


    type port loopbackPort message {
      inout Message_PDU
    }
```

What to test: ASN.1-to-TTCN value range restrictions

The following example shows the validation of an ASN.1 value range restriction during TTCN-3 value assignments.

```
ASN1module DEFINITIONS ::=
BEGIN

TestType  ::= SEQUENCE {
 field1 INTEGER(0..65535),
 field2 INTEGER(0..255, ... , 256..65535),
 field3 INTEGER (0..15, ..., 32..63|250..255)
}

END
```

```
08:08:43.631  Starting compilation of the Matching_ASN_message script...
08:08:43.631  Starting compilation of the ASN1module script...
08:08:43.661  Script "ASN1module" compiled successfully. 0 errors, 0 warnings.
08:08:43.661  Script "Matching_ASN_message": Line 15: The source value is out of the constraint.
08:08:43.661  Script "Matching_ASN_message" contained errors. 1 errors, 0 warnings.
```

```
 9
10    import from ASN1module language "ASN.1:2002" all; // TTCN-3 reference to ASN.1
11
12    const TestType c_example := {
13     field1 := 5,
14     field2 := 1028,
15     field3 := 128
16    }
17
```

What to test: ASN.1 encoding/ decoding

Positive semantic test of encoder/decoder matching between two ASN.1 engines:

08:31:22....	CONTROL			The test case "Sem_B0101_matching_specific_value_002.TC_Sem_B0101_matching_specific
08:31:23....	MTC	MTC(id ...	SYSTE...	ASN1module.TestType := { field1 := 5, field2 := 1028, field3 := 250 }
08:31:23....	MTC	SYSTE...	MTC(id ...	ASN1module.TestType := { field1 := 5, field2 := 1028, field3 := 250 }
08:31:23....	MTC			Verdict update: <pass> (TC: "MTC", ID: 1, Script: Matching_ASN_message, Line: 44).

Negative semantic test of encoder/decoder matching between two ASN.1 engines:

08:39:43....	CONTROL			The test case "Sem_B0101_matching_specific_value_002.TC_Sem_B0101_matching_
08:39:43....	MTC	MTC(id ...	SYSTE...	ASN1module.TestType := { field1 := 5, field2 := 1028, field3 := 250 }
08:39:43....	MTC	SYSTE...	MTC(id ...	?: 00 05 81 02 02 40 80 20 00
08:39:43....	MTC			Verdict update: <fail> (TC: "MTC", ID: 1, Script: Matching_ASN_message, Line: 47).

These tests can be executed in BER, PER aligned, PER unaligned, ... etc versions.

Should experts involved e.g. in LTE testing be consulted about which parts of ASN.1 syntax to focus on?

Conclusions

This presentation has proposed an ASN.1 related additional scope for the next TTCN-3 conformance testing STF. Since ASN.1 is very widely used (LTE, ITS, etc.), its reliable handling is important for the overall test tool quality. It is proposed to be considered when defining the ToR of this next STF.

Thank you for the attention. Contact for questions:

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